Arno C. Fieldner

By Harry Cooper, Ch.E. 2

Arno C. Fieldner, Chief Engineer, Experiment Stations Division, United States Bureau of Mines, has specialized in gas and fuel engineering and research ever since graduating from Ohio State University in Chemical Engineering in 1906. He was one of the first two graduates in this course. After a short period as industrial fuel engineer with the Denver Gas and Electric Company, in Denver, Colorado, he was recalled to the campus of Ohio State in 1907 by the late Professor N. W. Lord, then head of the School of Mines, for special research on coal for the United States Geological Survey. Old-timers at the University will recall that Professor Lord was the outstanding authority on coal at that time and was in charge of the Government's chemical work on the composition of American coals and their utilization.

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After a short period at Columbus, Fieldner was transferred, in the latter part of 1907, to the Government's laboratory at Pittsburgh, Pennsylvania, and in 1910 when the Bureau of Mines was created, took over this work. Fieldner was put in charge of the coal laboratory and later of the gas laboratory also.

While in the coal laboratory at Pittsburgh, Fieldner and another Ohio State alumnus, Joseph D. Davis, '05, who was in charge of the Bureau's Washington laboratory, made notable improvements in the methods of coal analysis which later were incorporated in the standard methods of the American Society of Testing Materials. His first paper, published in 1909, was the beginning of a long list of contributions to the better standardization of methods for sampling and testing coal. These papers have been published in the technical press and in technical papers and bulletins of the United States Bureau of Mines.

The Fieldner electric volatile matter furnace is now in common use in most coal laboratories, and the method which he standardized for determining the fusibility of coal ash has been adopted as standard by the Government and the testing societies.

On the entry of the United States into the World War, Fieldner responded to the call of his associate in the Bureau of Mines, George A. Burrell, also of Ohio State, who was placed in charge of the Government's war gas investigations. Within a week after war was declared, Fieldner had in operation three laboratories in separate isolated shacks on the grounds of the Pittsburgh Experiment Station of the Bureau of Mines, testing charcoals and soda-limes against various poisonous gases for use in American gas masks. He devised methods and apparatus for testing gas masks and absorbents that were later adopted by the Allies as superior to their own. He holds a patent on a multiple gas mask testing machine that simulates human breathing. The work begun at Pittsburgh was soon transferred to the American University, Chemical Warfare Section at Washington, D. C., where is constituted the Gas Mask Research Division of the Chemical Warfare Service. Fieldner was placed in charge with the rank of Major. One of the outstanding accomplishments of this division, from a peace-time point of view, was the invention of a mask for protection against ammonia fumes. This mask is now standard equipment around ammonia refrigerating machinery.

After the war Fieldner returned to Pittsburgh as supervising chemist of the Pittsburgh Experiment Station, and reorganized the staff which had been disrupted by the war. He gave special attention to peace-time application of war-time inventions. With the help of Sidney H. Katz, Ohio State, '09, he established a laboratory for the investigation of the use of gas masks in mines and industries. They showed that the carbon monoxide gas mask was a valuable auxiliary in fighting mine fires, and that certain absorbents could be combined for universal gas masks suitable for city firemen.

In June, 1921, he was promoted to the position of Superintendent of the Pittsburgh Experiment Station. About the same time he undertook in behalf of the Bureau of Mines the organization and direction of the pioneering research of the Bureau on the ventilation of the world's first vehicular tunnel for automobiles. This investigation was made in cooperation with the Vehicular Tunnel Commissions of the states of New York and New Jersey in connection with the Holland Tunnel under the Hudson River. By means of experimental research, the

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amount and composition of automobile exhaust gases under operating conditions was determined, as well as the minimum safe concentration of these gases. In recognition of this work, the University conferred the professional degree of Chemical Engineer in 1923. While the Holland Tunnels were under construction, Fieldner and Katz devised an extremely sensitive machine for continuously analyzing and recording the percentage of carbon monoxide in air. This apparatus, which is capable of detecting as little as five parts of carbon monoxide in one million parts of air, is now in daily use in the Holland Tunnels, the Oakland-Alameda Tunnel in California, and the Mersey Tunnel at Liverpool, England.

Shortly after completing the tunnel gas investigations, Fieldner and his staff at the Pittsburgh Experiment Station, in cooperation with Kettering's General Motors Research Corporation, undertook the investigation of the toxicity of exhaust gases from ethyl gasoline. The results of this comprehensive investigation extending over a period of several years was published in a large monograph in 1927. It was on the basis of this work that the use of tetra-ethyl lead was permitted by health authorities.

This major investigation was followed by another, also

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under Fieldner's immediate technical direction, on *Warning Agents for Manufactured Gas.* The American Gas Association came to the Bureau of Mines with the request that a thorough search be made for substances which might be added to odorless gas to give it a detectable odor that would give warning of the escape of gas. As a result of this work over a period of three years, a number of suitable substances were found which imparted strong warning odors. Some of these are now regularly used in natural gas in California. However, the research also showed that certain substances of an irritating nature such as croton aldehyde would waken sleeping persons before they became asphyxiated by the gas. It is only a question now of developing methods of manufacturing these substances on a large scale cheaply enough for practical use. A monograph by Fieldner and his associates describing this work was published last year.

In 1927 Fieldner was promoted to his present position of Chief Engineer in charge of the Experimental Stations of the Bureau of Mines. Despite the fact that these stations extend from New Brunswick, New Jersey, on the East to Berkeley, California, on the West Coast, he finds time to direct the coal research of the Bureau of Mines and to guide the activities of the important American Standards Association committee on the Classification of Coal, and the American Society of Testing Materials committee on Coal and Coke.

During the past year Fieldner and his long-time associate in the Bureau, Joseph D. Davis, have developed a new apparatus and method for determining the gas, coke, and by-product making properties of coal. In cooperation with the American Gas Association they are making a survey of American coals.

In 1931, Fieldner was awarded the Lamme Medal, being one of the first two of Ohio State's graduates to receive this honor. The Lamme Medal is the result of a bequest made by the late Benjamin Garver Lamme, a graduate from the Ohio State University in 1888 and for many years the Chief Engineer of the Westinghouse Electric and Manufacturing Company. Mr. Lamme was always a firm believer in the promotion of engineering education. His will provides that the income from his bequest shall be used to pay for a gold medal to be given annually to a graduate of one of the technical departments or of the technical arts departments of Ohio State University for meritorious accomplishments in engineering. The first two awards have been granted to Charles Edward Skinner of the Class of 1890, and Arno C. Fieldner of the Class of 1906.

Aside from work Fieldner likes to hunt and fish. He prefers above all things to enlist about three other congenial disciples of Izaak Walton and embark on a two- or three-weeks canoe trip through the wilds of Northern Ontario. Among his friends he is a recognized authority on the region in and around the Temagami Forest Reserve. In 1923, in company with Sidney H. Katz and

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two other members of the Pittsburgh Station staff, he discovered a new sub-species of brook trout. The discovery was reported to the Carnegie Museum at Pittsburgh, who sent an expedition to this lake the following year with one member of the Bureau party for more specimens. These trout, now called Auro trout (*Fontinelis temagamiensis*) are on exhibition at the Carnegie Museum at Pittsburgh, Pennsylvania.

Fieldner spent six months in Europe in 1924 and three months in 1929 visiting laboratories and industrial plants, studying the carbonization and processing of coal and safety in mine research. He has for a number of years been chairman of the committee on coal and coke of the American Society of Testing Materials, has twice been chairman of the chemical committee of the American Gas Association, and is a member of the managing committee of the technical section of this association. He has served as chairman of the Gas and Fuel Division of the American Chemical Society, and as chairman of the Steel Works Section of the Engineers Society of Western Pennsylvania. He is a member of the Cosmos Club of Washington, D. C., and the Coal Research Club of London, and is the American editor of *Fuel in Science and Practice.*